



Leica-microsystems nově v Pragolab

Mikroskopy Leica

Martin Kopecký



Obsah

- Leica Microsystems a historie
- Popis klasických mikroskopů
- Kontrastní metody a základní principy
- Aplikace pro mikroskopy
- Konfokální mikroskopy
- Superrozlišovací mikroskopy STED 3X, GSD
- Novinky Leica LightSheet, DVM6

Leica Microsystems

- Founded as a family business in the nineteenth century, the company is now a global enterprise.
- Leica Microsystems has seven major plants and product development sites located in **Wetzlar and Mannheim (Germany), Vienna (Austria), Heerbrugg (Switzerland), Cambridge (UK), Shanghai (China), and Singapore**. The company is represented in over 100 countries, has sales and service organizations in 20 countries, and an international network of distribution partners. Its headquarters are located in Wetzlar, Germany. Leica Microsystems is part of Danaher.



Historie - Leica Microsystems



1847 - Foundation of Spencer Lens/American Optical Instruments in USA.



1849 - Carl Kellner establishes the "Optical Institute" in Wetzlar.



1853 - Foundation of the Bausch & Lomb Instruments Division in USA.



1869 - Ernst Leitz takes over the "Optical Institute" and renames the company Ernst Leitz.



1872 - Foundation of the precision engineering company R. Jung in Heidelberg.



1876 - Foundation of the optical company C. Reichert in Vienna.



1881 - The son of Charles Darwin, Horace, establishes the optical company "Cambridge Instruments".



1907 - The 100.000th microscope is presented to Nobel prize winner Robert Koch.



1921 - Foundation of the optical company Wild Heerbrugg in Switzerland.



Wild and Leitz Brands

1972 - Beginning of cooperation between Leitz Wetzlar and Wild Heerbrugg.



1976 - Metals Research expanded and bought Cambridge Instruments (1st manufacturer of Scanning Electron Microscopes).



1981 - Foundation of the Wild Leitz group.

Historie - Leica Microsystems

Reichert Jung

1986 - Takeover of Reichert-Jung by Cambridge Instruments.



1990 - The Wild Leitz and Cambridge Instruments groups merge to form the Leica group.



1993 - 1st Joint Venture Opening of the Leica group in China for specimen preparation.



2005 - Danaher Corporation acquires Leica Microsystems.

Winner 2005



Innovationspreis der deutschen Wirtschaft
The World's First Innovation Award

2006 - German Innovation Award for high-resolution microscope with 4PI technology.



DEUTSCHER ZUKUNFTSPREIS
Preis des Bundespräsidenten
für Technik und Innovation

2006 - Prof. Stefan Hell receives German Future Award from the German Federal President for the STED microscope



2012 - Leica Microsystems was awarded the Manufacturing Excellence (MX) Award 2012 as an overall winner and also received the MX Award 2012 in "Logistics and Operational Efficiency" category



2013 - The Scientist named the Leica SR GSD 3D the third innovative product



July 2014 - R&D Magazine's "Oscar of Invention" for Leica TCS SP8 STED 3X: Voted among the 100 Most Innovative Technologies 2014.



August 2014 - Microscopy Today 2014 Innovation Award for Leica Microsystems' Super-Resolution System Leica SR GSD 3D.



October 2014 - Father of Super-Resolution Stefan Hell awarded Nobel Prize in Chemistry.

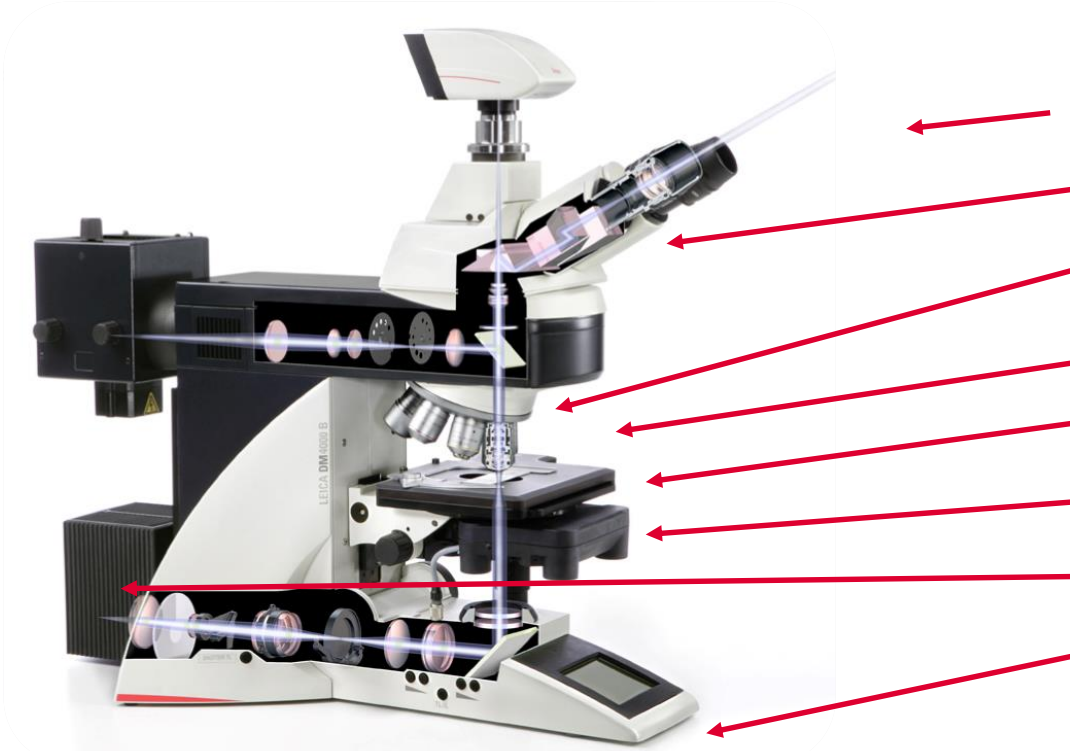
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Vzpřímený mikroskop

Popis součástí

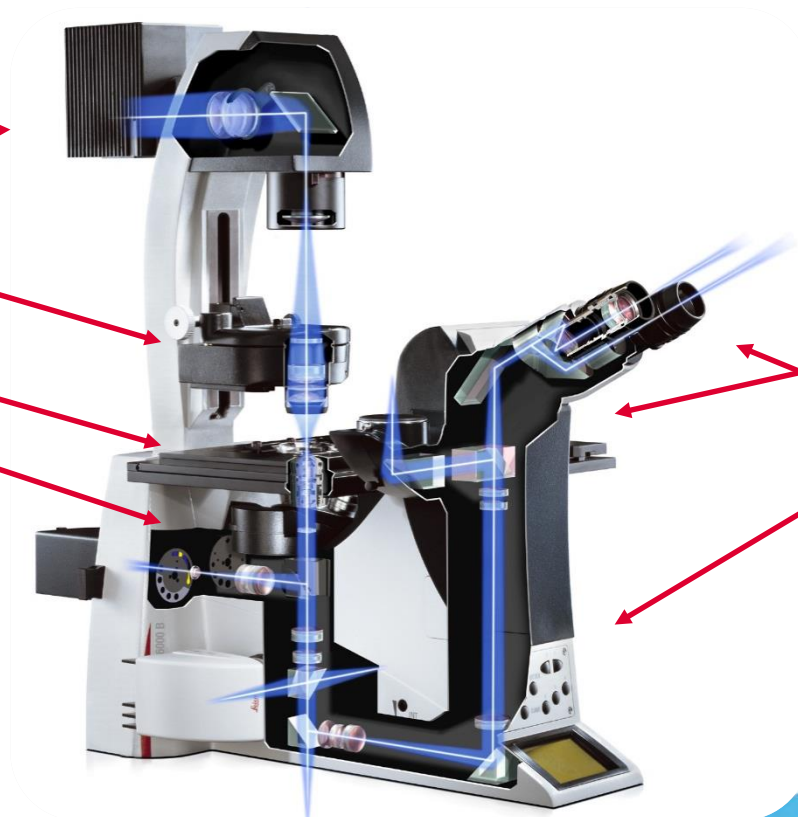
- Okuláry
- Tubus
- Objektivový revolver
- Objektiv
- Stolek
- Kondenzor
- Lampa LED...
- Základní stativ



Invertovaný mikroskop

Popis součástí

- Lampa
- Kondenzor
- Stolek
- Objektiv
- Objektivový revolver
- Fluorescence



- Tube
- Eyepiece
- Basic stand

Nový invertovaný mikroskop Leica DMI8



- 10 let zkušeností LiveCells
- Nový design
- Nové možnosti sestav a upgrade
- Také pro konfokální mikroskopy
- Infinity port
- Fluorescence
- TIRF a další

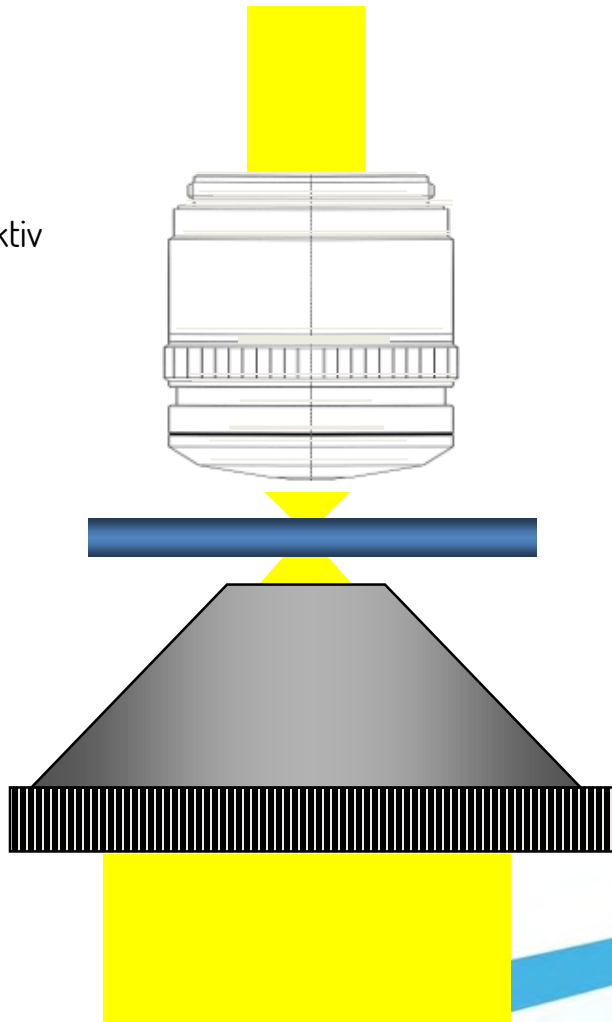
Nový software Leica - LAS X

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Kontrastní metody – procházející světlo

brightfield objektiv

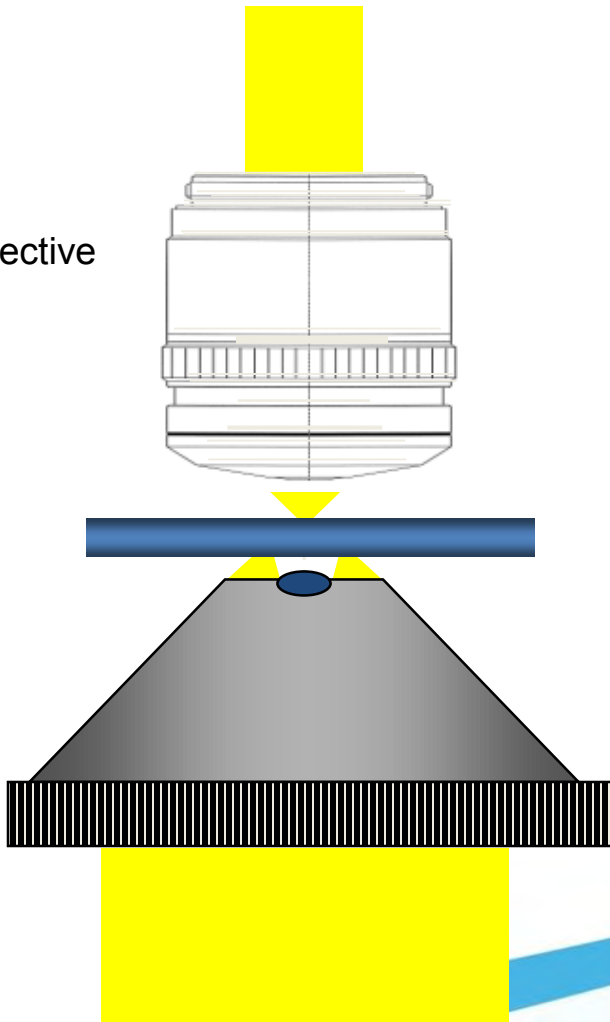


transmitted light Brightfield

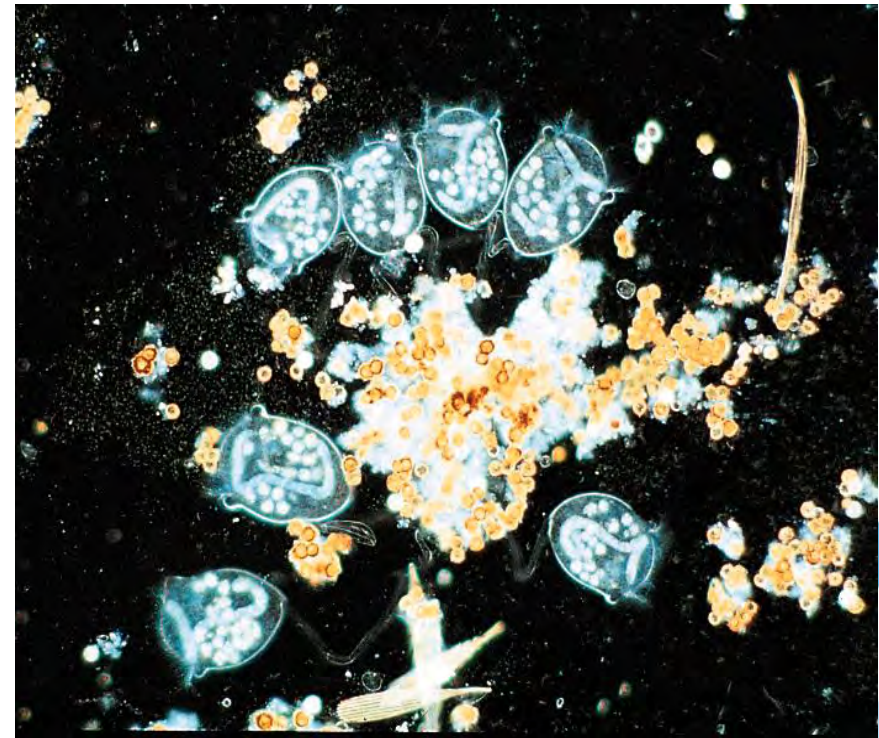


Kontrastní metody – procházející světlo

brightfield objective



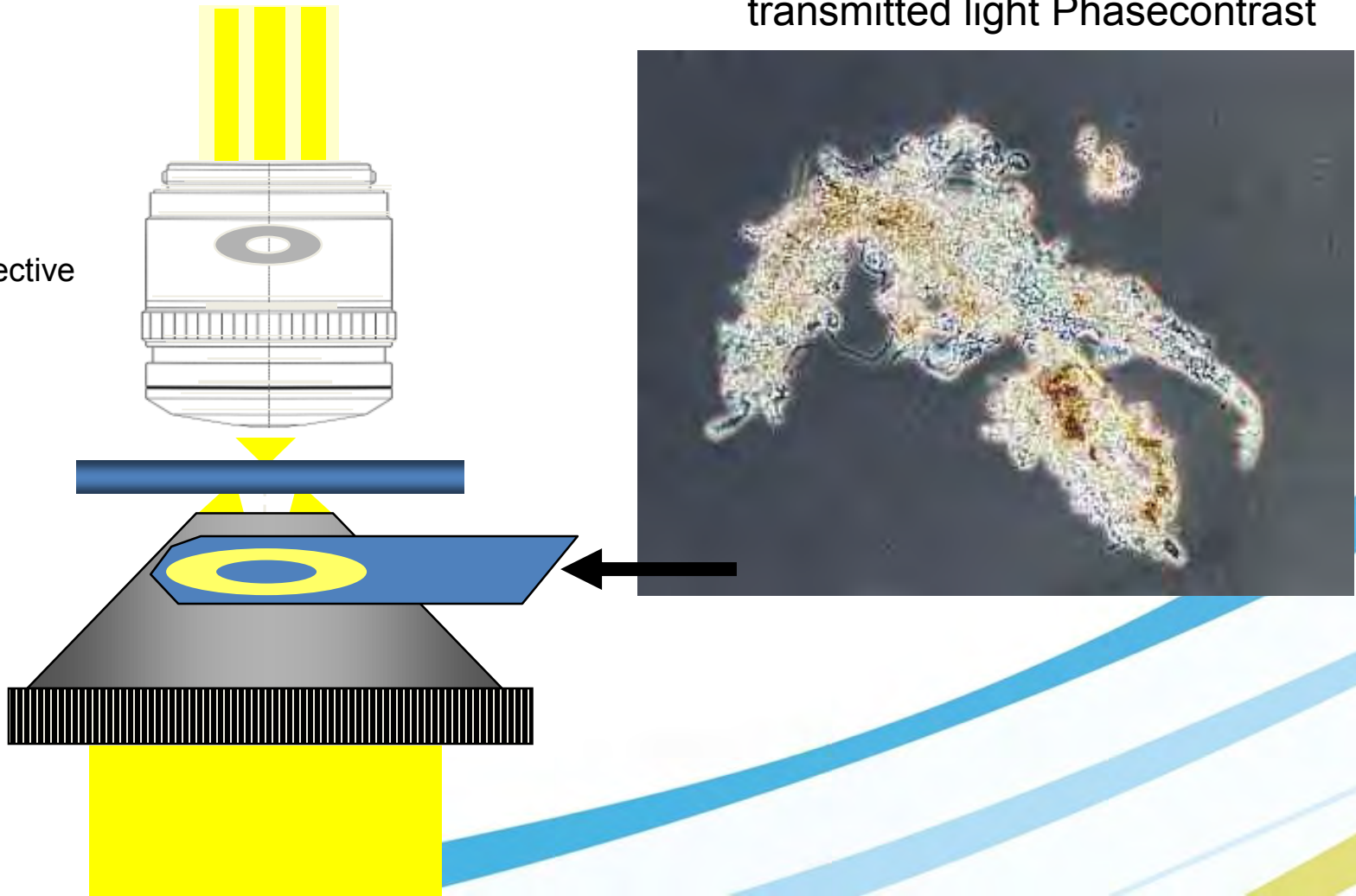
transmitted light Darkfield



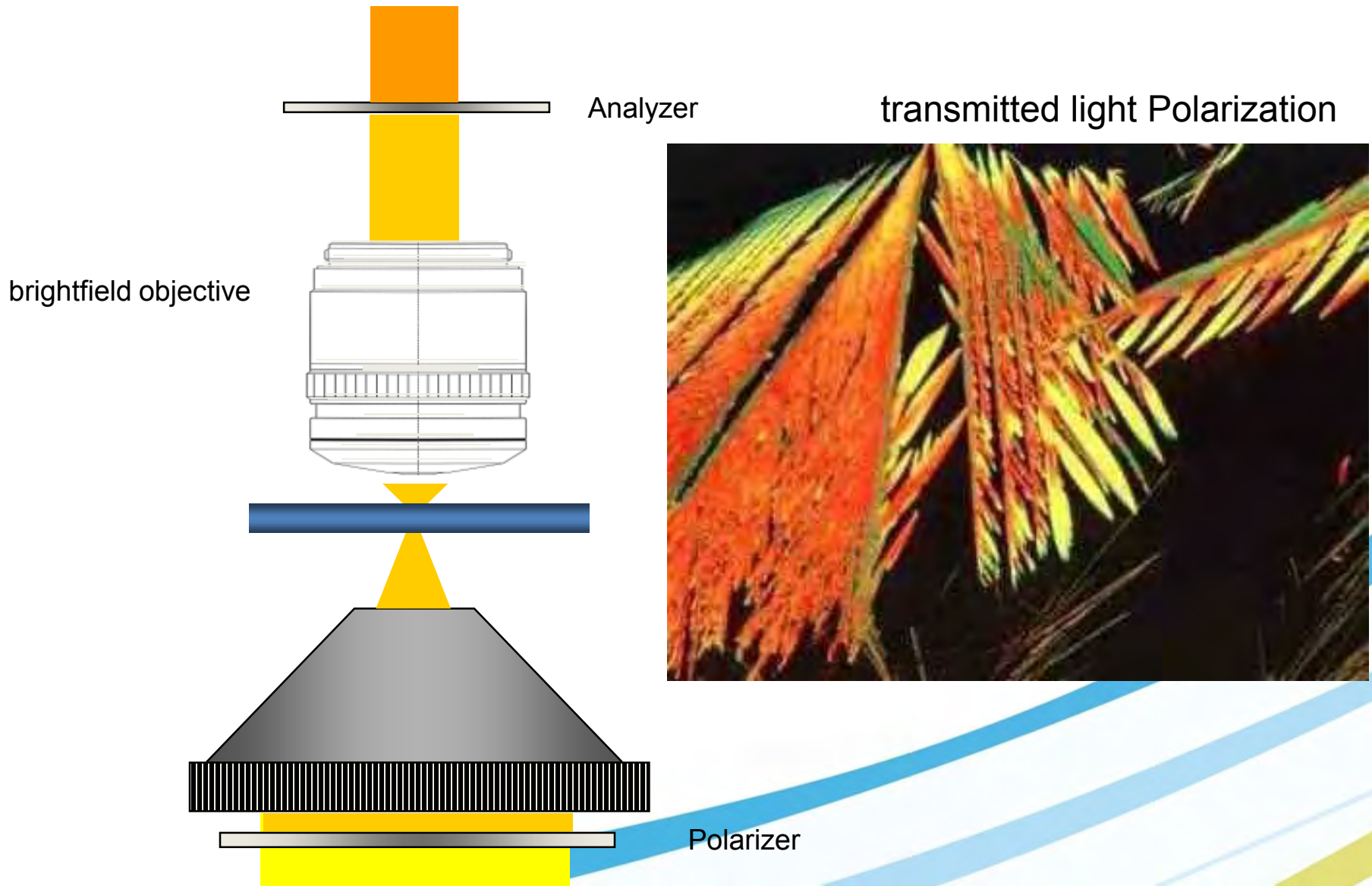
Kontrastní metody – procházející světlo

transmitted light Phasecontrast

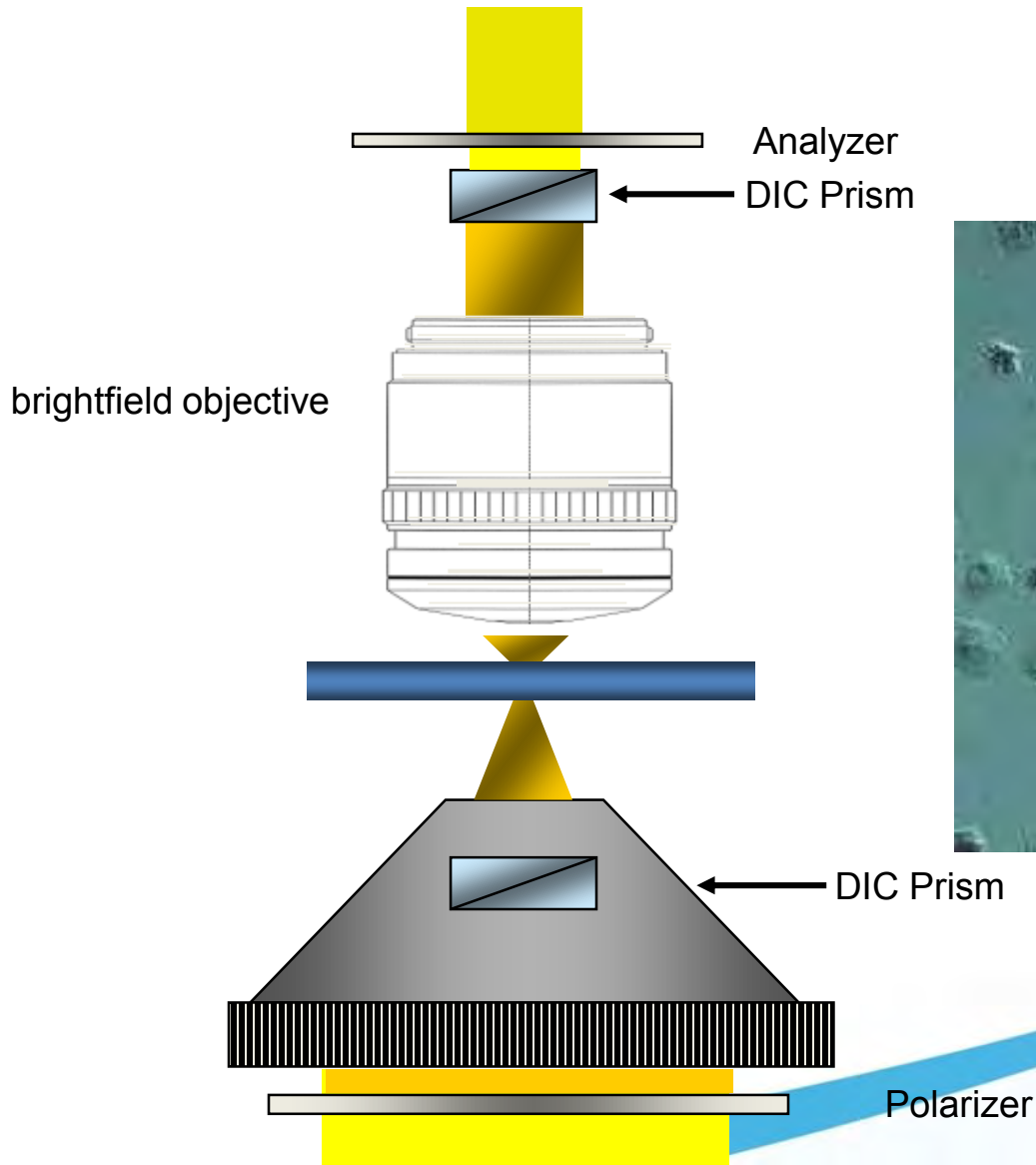
Phaco objective



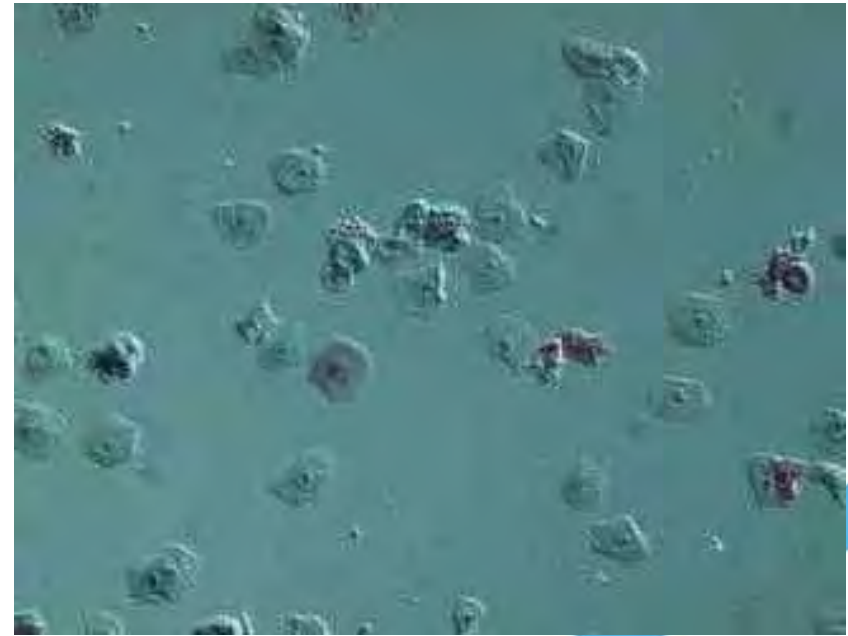
Kontrastní metody – procházející světlo



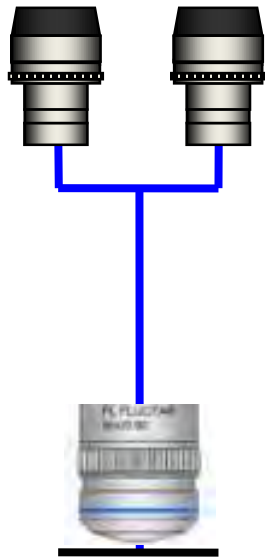
Kontrastní metody – procházející světlo



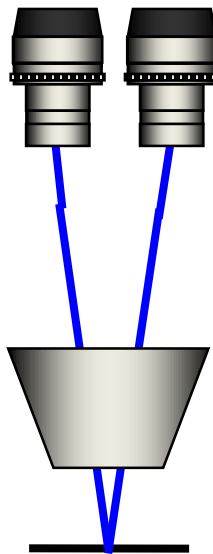
transmitted light DIC



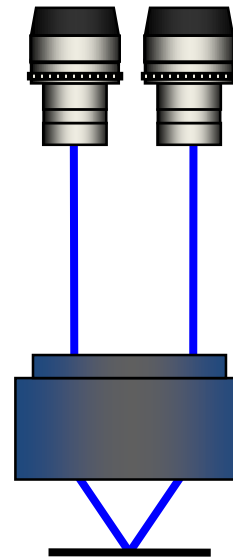
Různé typy mikroskopů



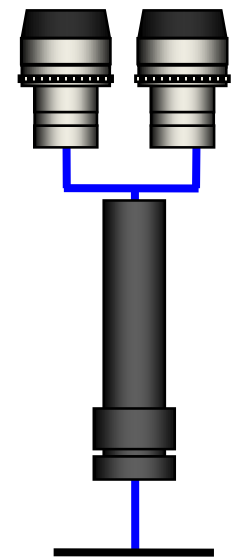
Microscope
NA
1.4
Magnif.
(1400x)



Greenough
NA
0.2
Magnif.
(200x)



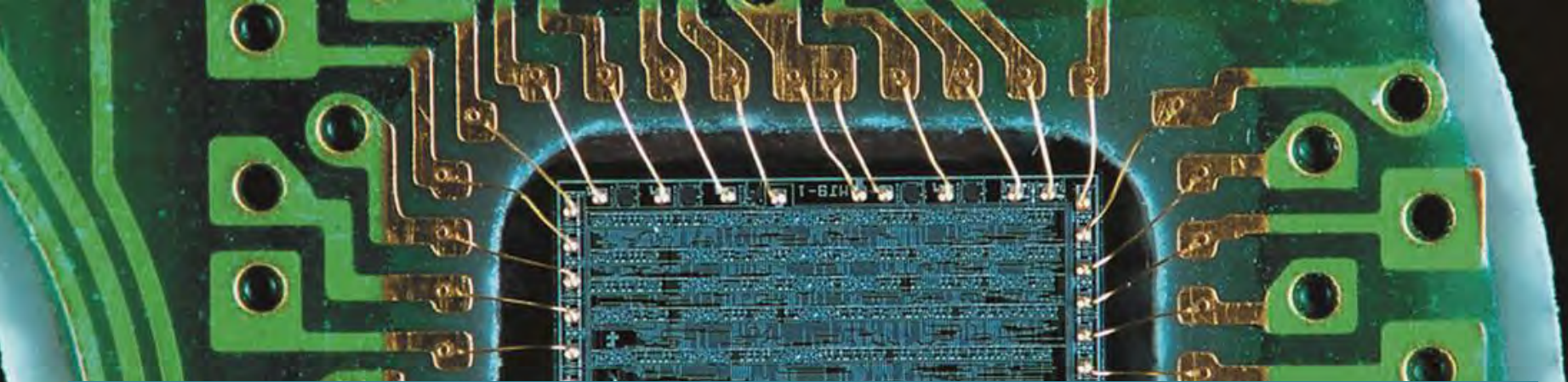
CMO
NA
0.2
Magnif.
(200x)



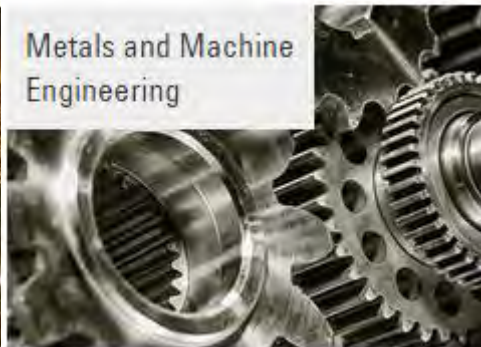
Macroscope
NA
0.23
Magnif.
(230x)

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Industry & Manufacturing





Materials, Forensics

Materials Science,
Physics, &
Engineering

A microscopic view of a rough, crystalline material surface, showing various shades of brown, tan, and purple. The texture is highly irregular and porous.

Geology,
Environmental,
Paleontology, &
Earth Science

A microscopic view of a mineral specimen, showing a complex, crystalline structure with prominent yellow and blue colors. The surface is highly textured and appears to be a natural rock formation.

Museums & Art
Conservation

A painting depicting a scene with a man in a blue robe and a woman. The man is looking towards the woman, and there are other figures in the background. The style is classical, with detailed shading and a focus on human figures.

Firearms &
Toolmarks

A close-up photograph of a metal surface, showing a circular mark and a toolmark. The metal is dark and has a rough, textured appearance. The circular mark is slightly recessed, and the toolmark is a distinct, curved line.

Trace Evidence

A photograph of a thin, dark object, possibly a fiber or hair, against a light background. The object is long and thin, with a slightly irregular shape. It is positioned diagonally across the frame.

Questioned
Documents &
Handling

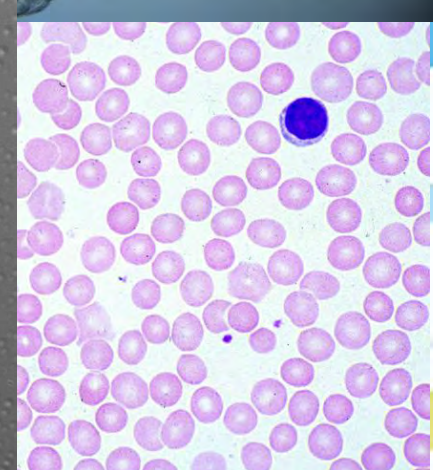
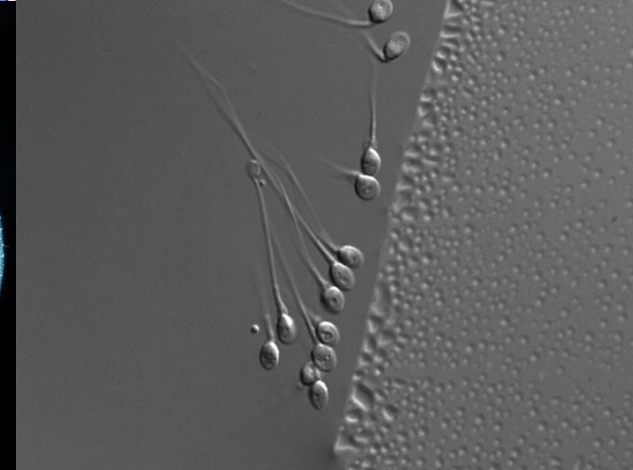
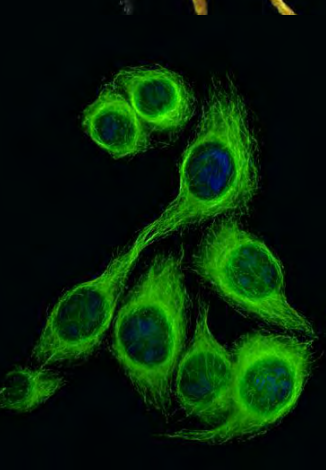
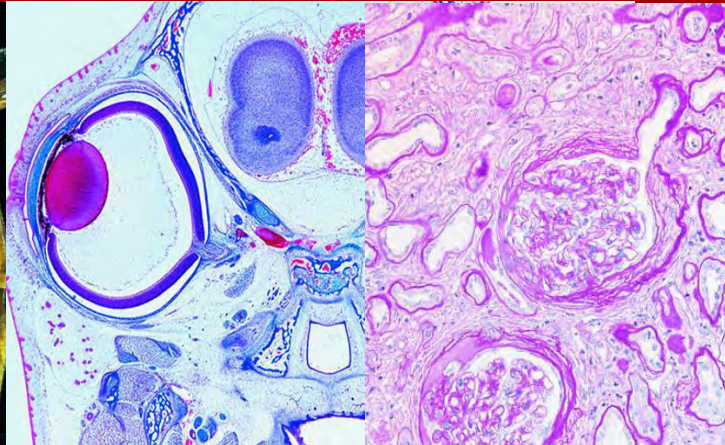
A close-up photograph of a document with Greek text and a ruler. The text is printed in a serif font and is partially obscured by a ruler. The ruler is placed horizontally across the text, and the Greek characters are clearly visible.

Forensic Medicine
& DNA Extraction

A microscopic view of a biological sample, possibly a cell or tissue. The image shows a dense field of small, blue-stained cells or structures, with some larger, more distinct features.



Life Science Research



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THE SCALE OF THINGS

Things Natural



- wave length of light: 400-700 nm = 0.4 -0.7 μm
- diameter of hair (50-300 μm)
- yeast cell 80 μm
- pollen grain 50-200 μm
- human egg cell 100 μm
- human sperm cell 5 μm
- nuclei of cells 5-10 μm
- E. coli bacterium 2 μm
- virus 50-100 nm
- (Influenza 120 nm)
- cellular membrane 7nm
- DNA-double helix 2 nm

The Microworld

The Nanoworld

Progress in atomic-level understanding

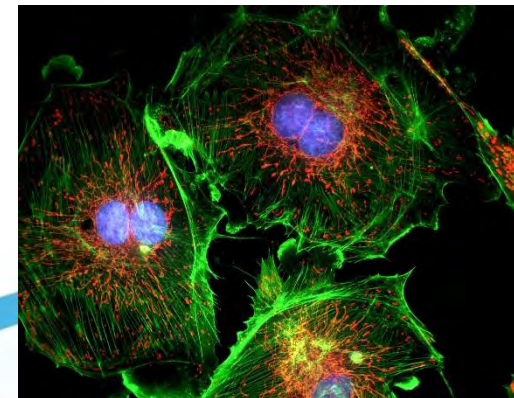
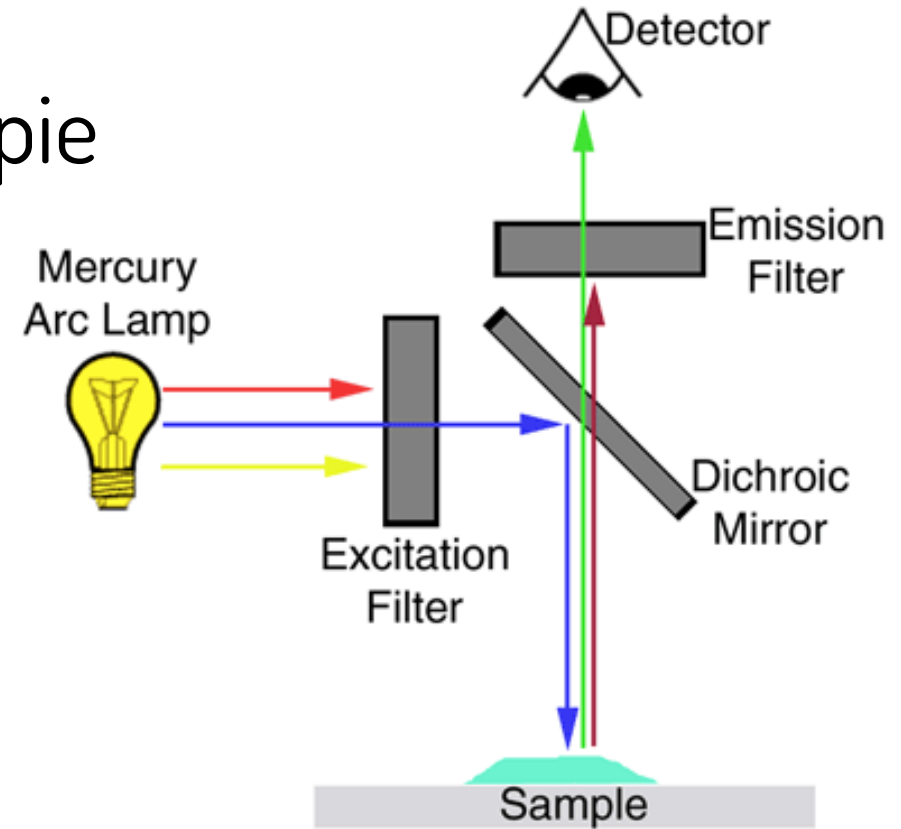
Progress in miniaturization

The 21st century challenge -- Fashion materials at the nanoscale with desired properties and functionality

Fluorescenční mikroskopie

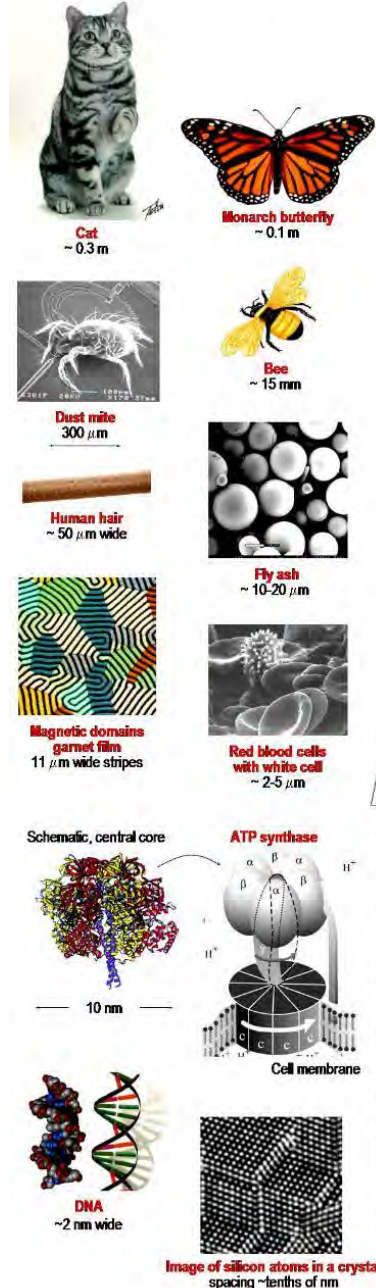
Definice fluorescence:

1. Nastane-li emise záření z excitovaného elektronového stavu jedním či více spontánními energetickými přechody jedná se o fluorescenci.
2. Praktické kritérium: fluorescenci pozorujeme během buzení a po jeho vypnutí prakticky ihned mizí (doba dohasínání je obvykle řádově 10^{-8} s).



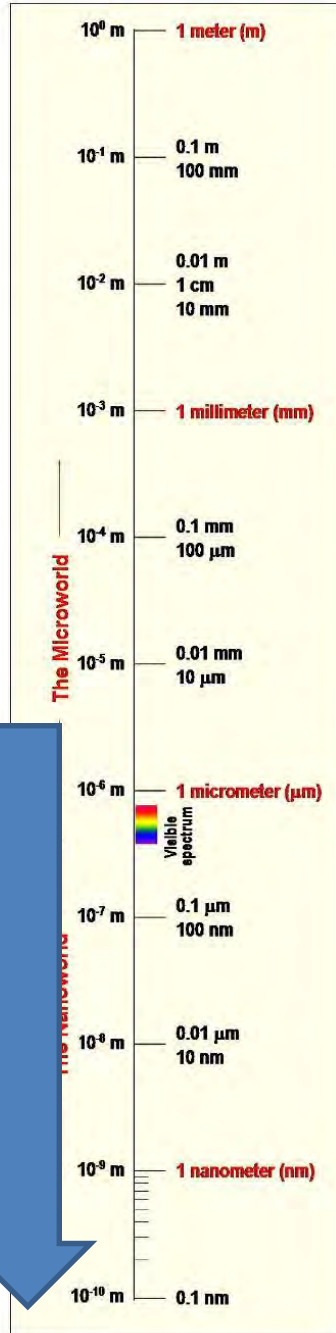
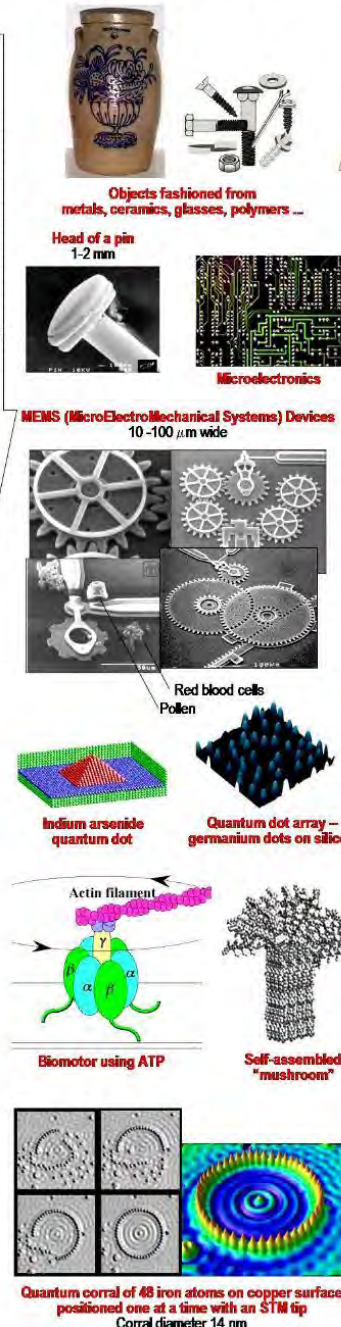
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- virus 50-100 nm
- (Influenza 120 nm)
- cellular membrane 7nm
- DNA-double helix 2 nm

Things Manmade



Progress in miniaturization

The 21st century challenge -- Fashion materials at the nanoscale with desired properties and functionality

Rozdíl klasické a konfokální mikroskopie

Kamera
CCD, SCMOS...

Excitace
pomocí fluo
lampy

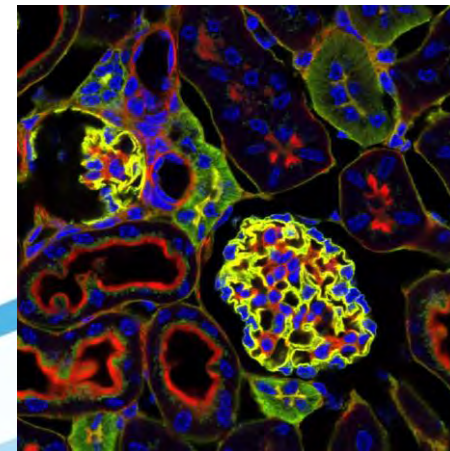
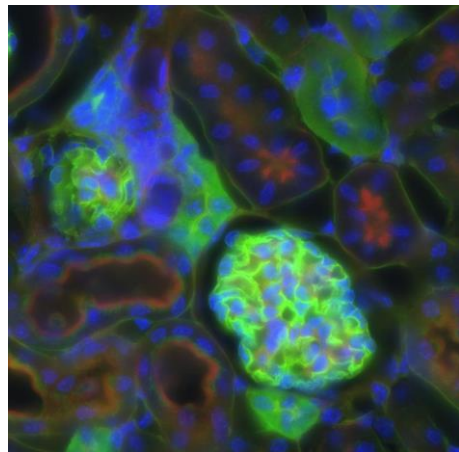
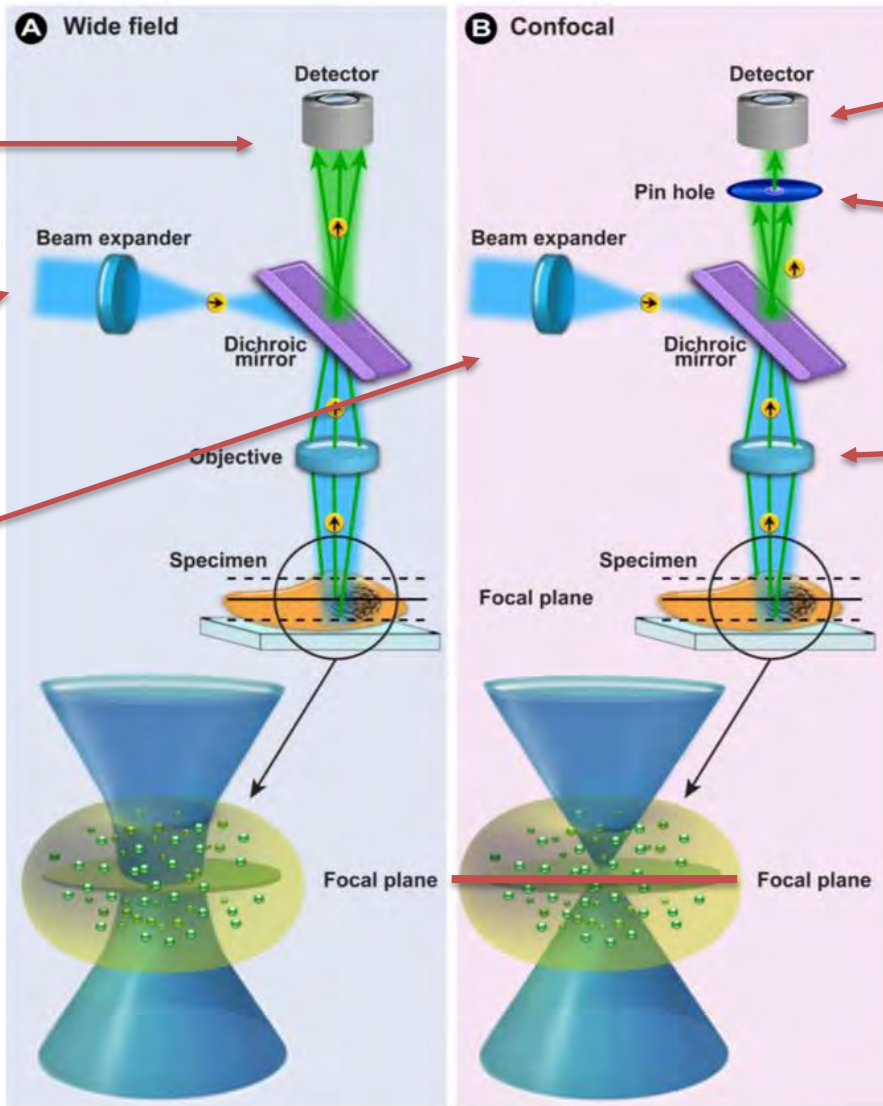
Excitace
pomocí
laserů

Elektronický
Detektor
HyD, PMT

Pinehole

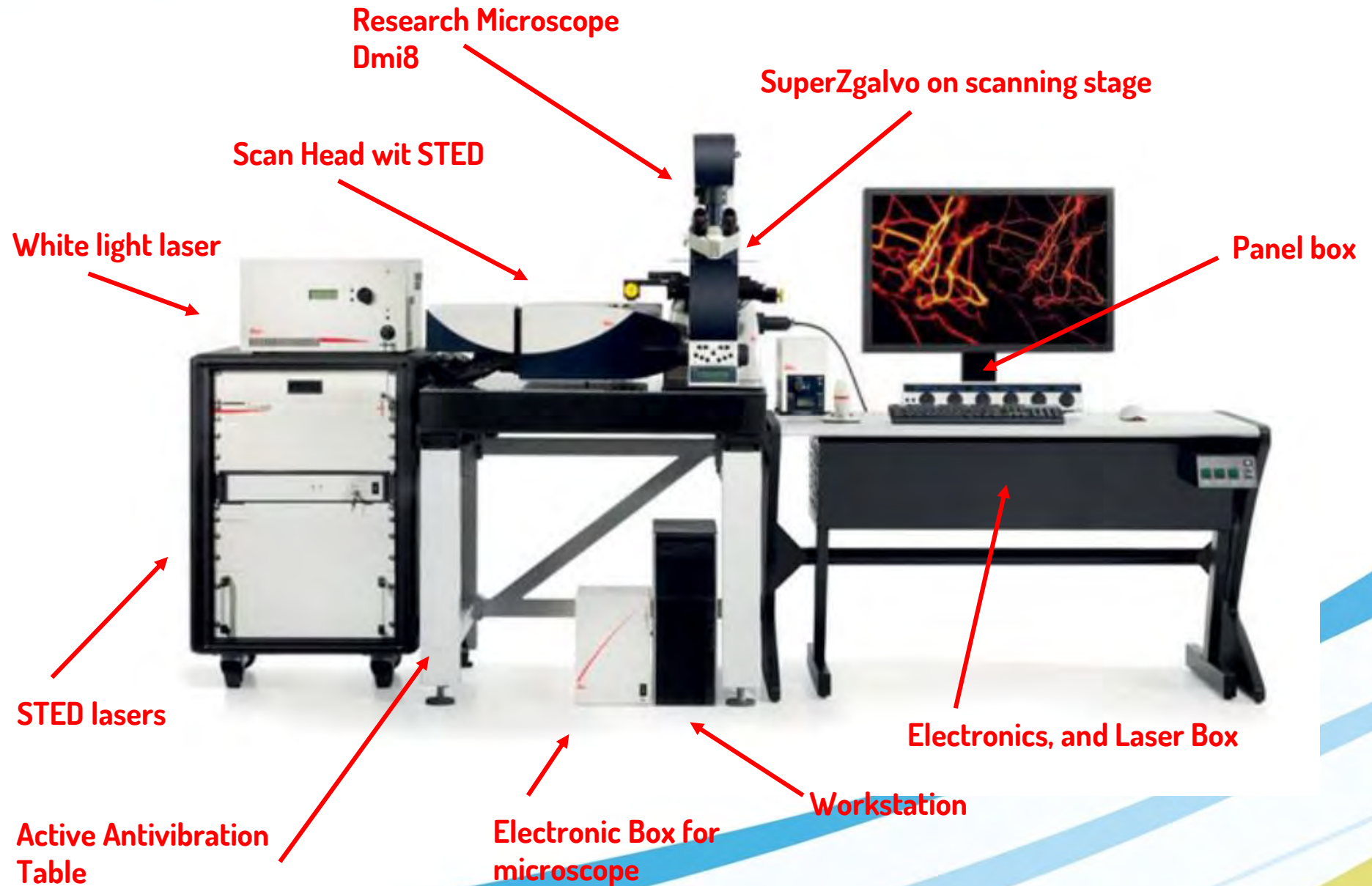
Optika

Vzorek

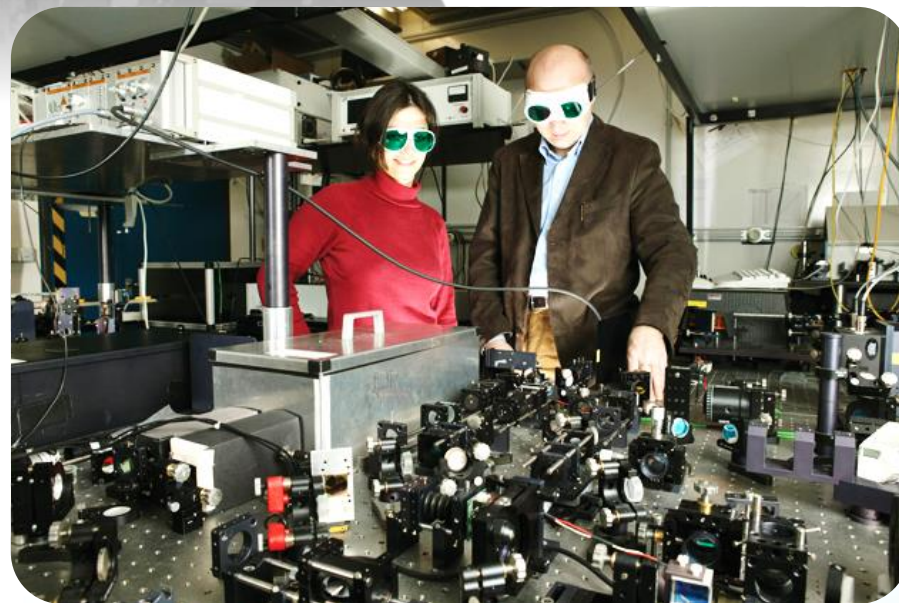
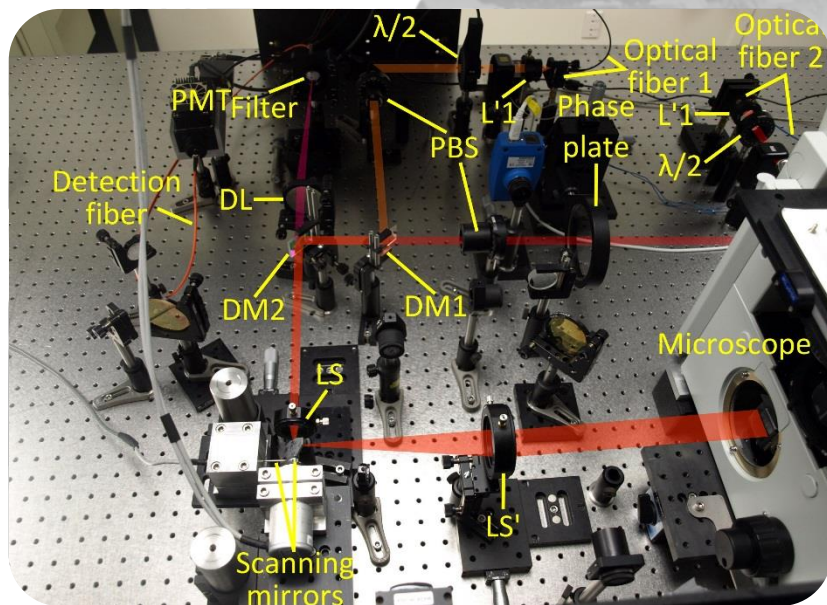
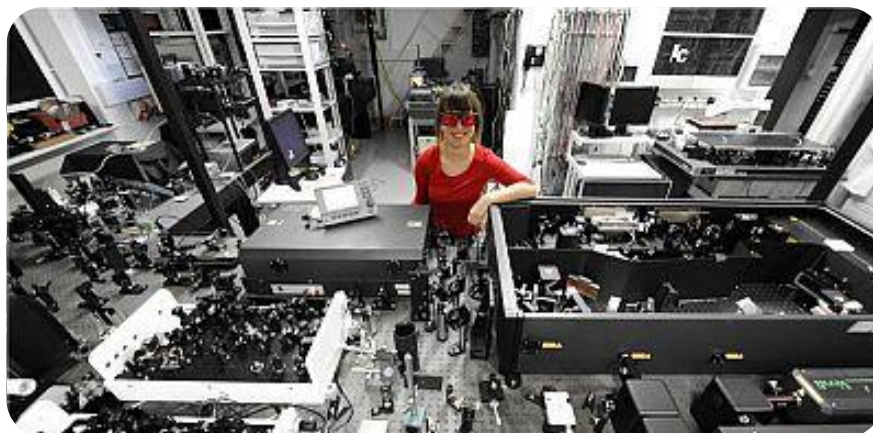


Rez ledvinou

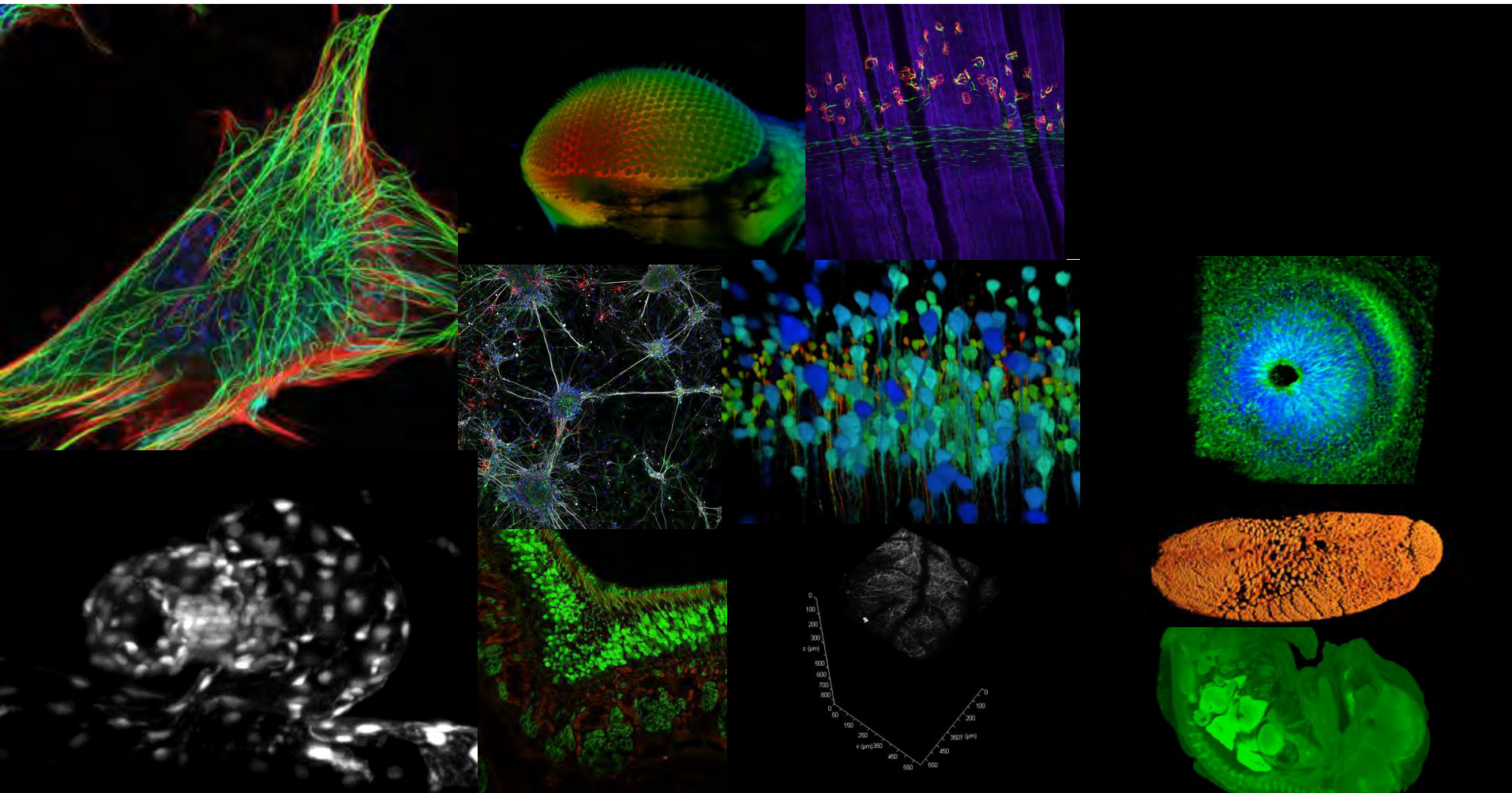
TCS SP8 "Evolution" – Univerzální platforma



Chcete to zkusit sami?



Life Science Research – Konfokální mikroskopie aplikace



Úvod

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- Novinky Leica LightSheet, DVM6

Nobelova cena



- STED 3X

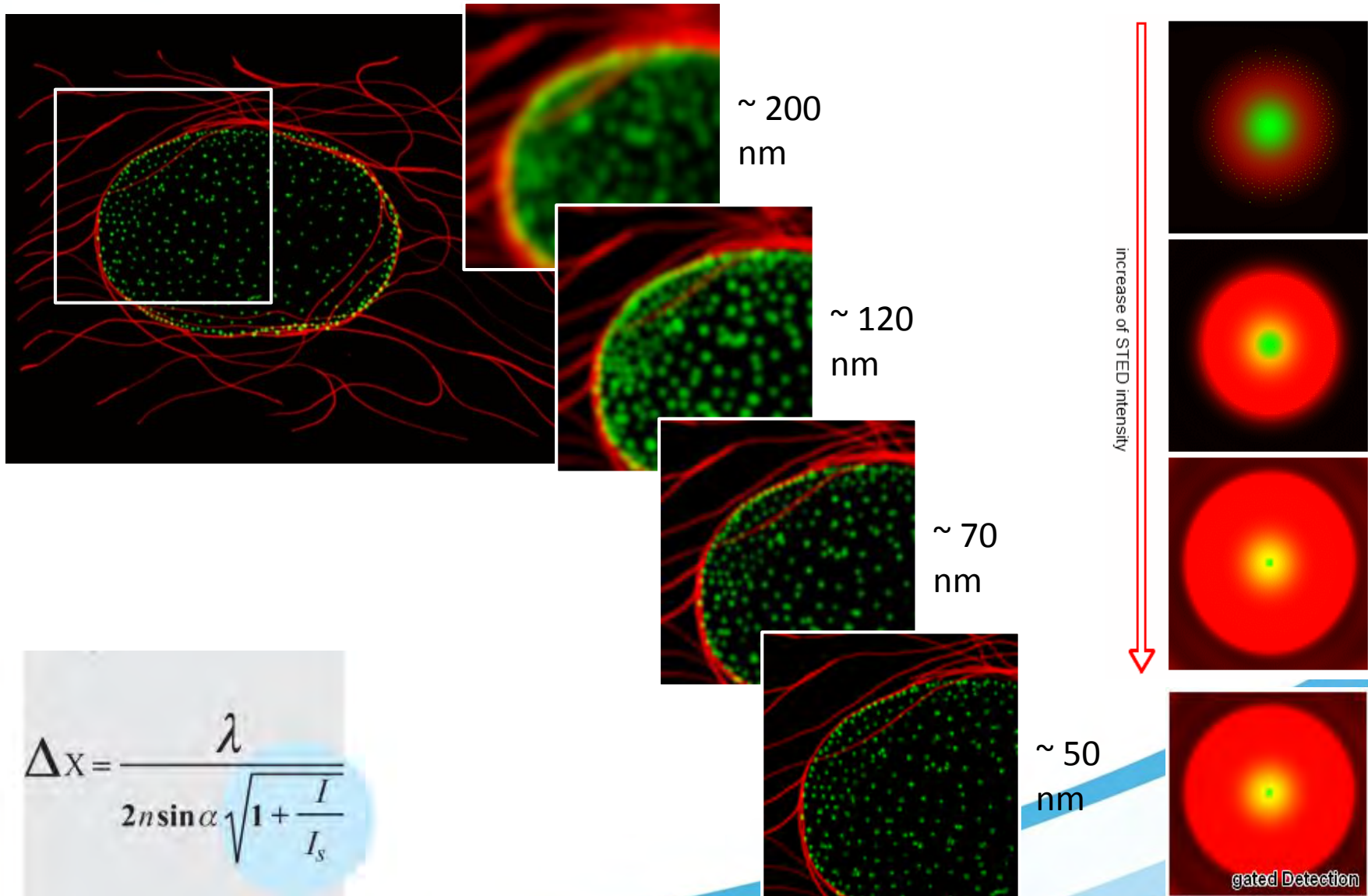
- Eric Betzig and William Moerner of the US and Stefan W Hell of Germany
- Confocal TCS SP8 STED 3X resolution below 50 nm

Life Science Research – Superrezoluční mikroskop

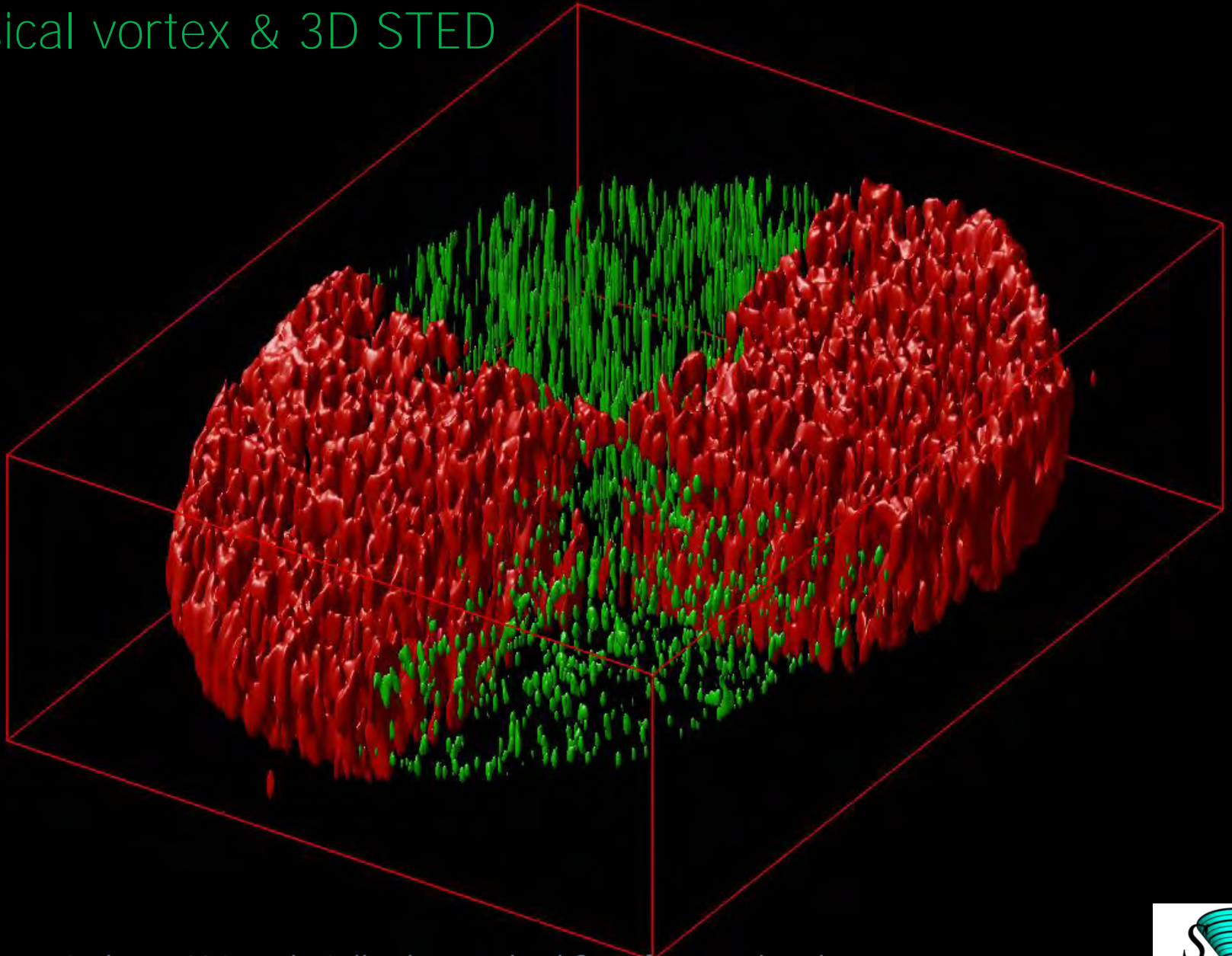


- Laser systems, inverted or upright microscopes
- WD systém TCS SR GSD 3D resolution below 25 nm
- Confocal TCS SP8 STED 3X resolution below 50 nm

STED microscopy allows to tune resolution



Different level of details seen by **confocal**
classical vortex & **3D STED**



Histone H3 Alexa 568 in Hela Cells: deconvolved & surface rendered

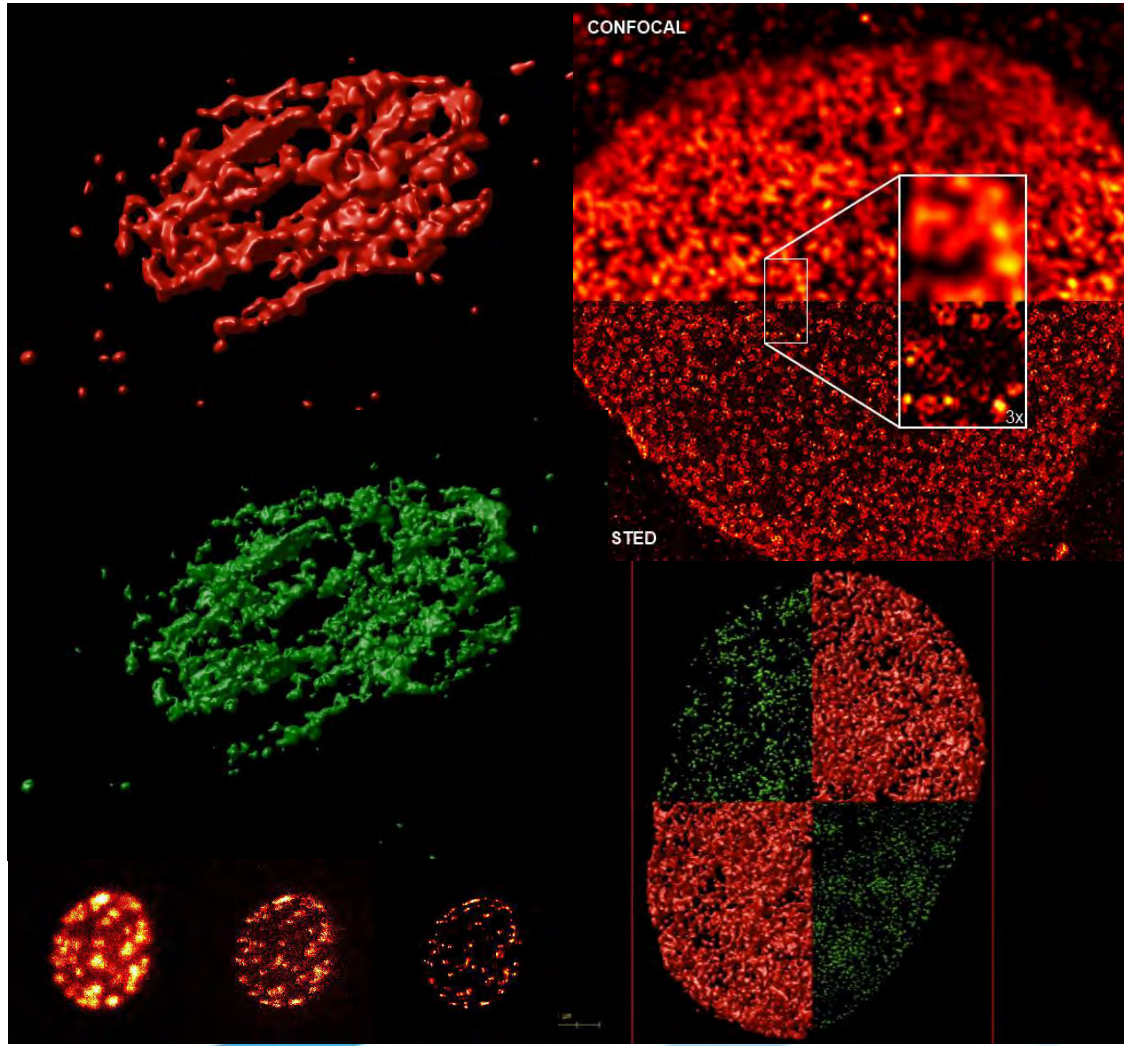
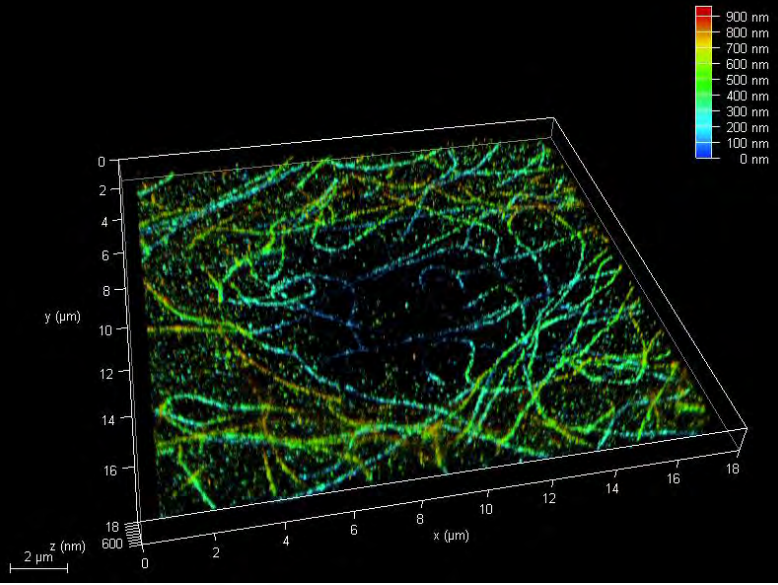
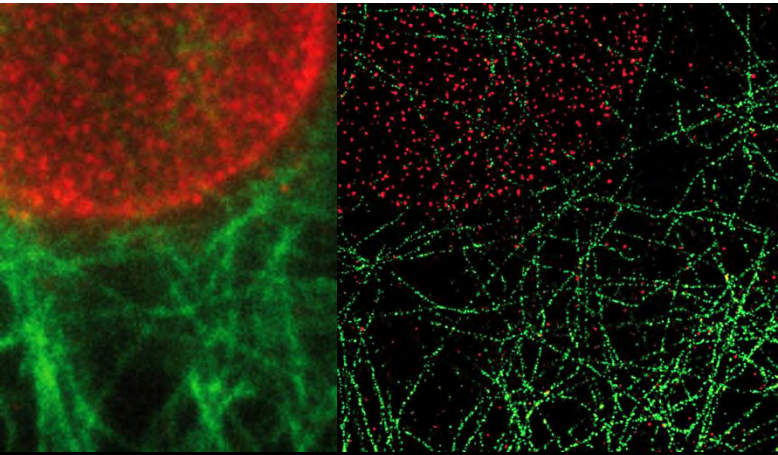


Life Science Research – Superrezoluční mikroskop

Aplikace

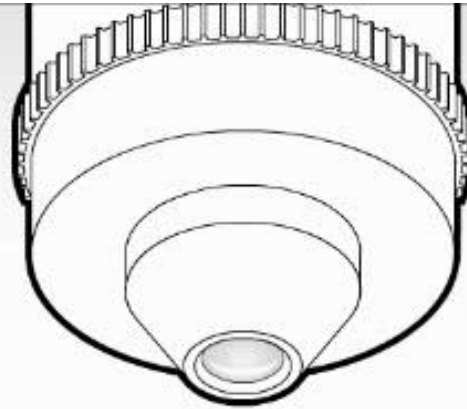
Leica SR GSD 3D

Leica TCS SP8 STED 3X



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Benefits of Light sheet Imaging

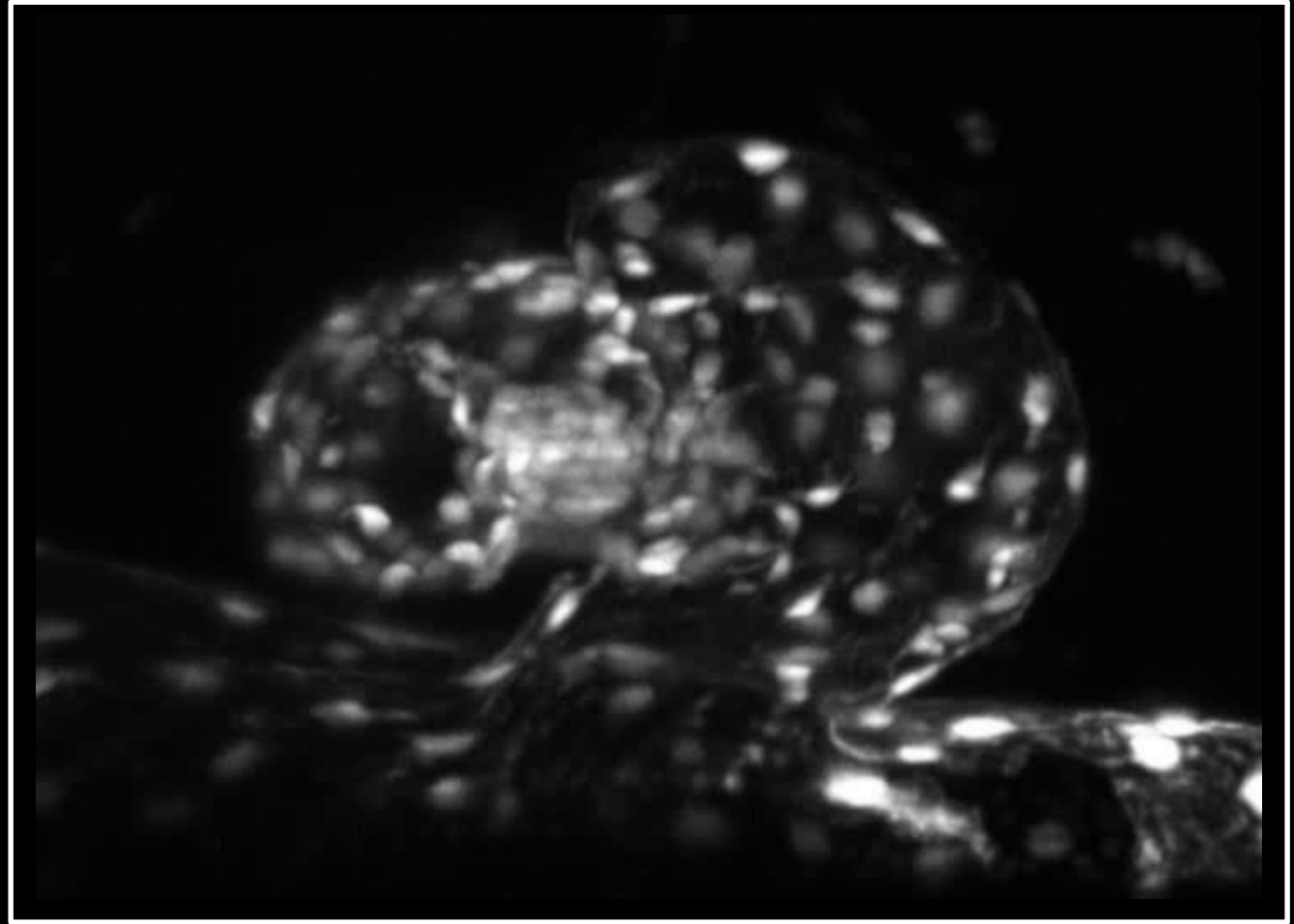
Low
Phototoxicity



Drosophila dorsal closure, dt=30s, z=150 μ m, for 6hrs

Benefits of Light sheet Imaging

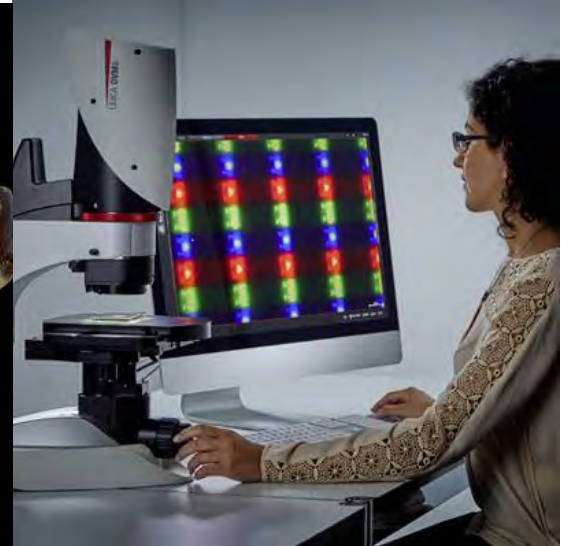
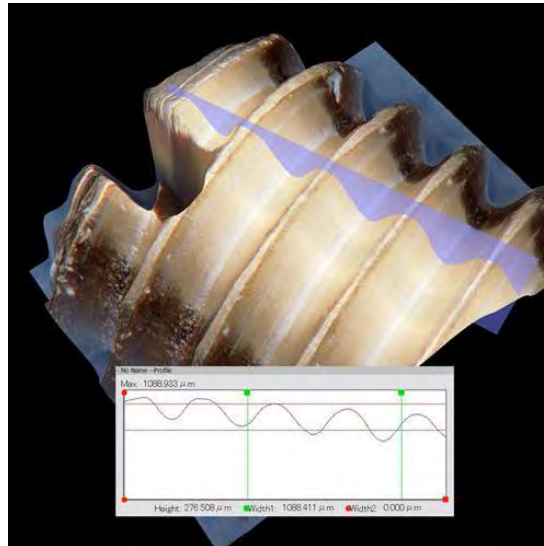
High Imaging
SPEED



3D reconstruction of a zebrafish heart, 120fps

Courtesy of Emily Steed, Vermot Lab, IGBMC Strasbourg

Nový digitální mikroskop - Leica DVM6

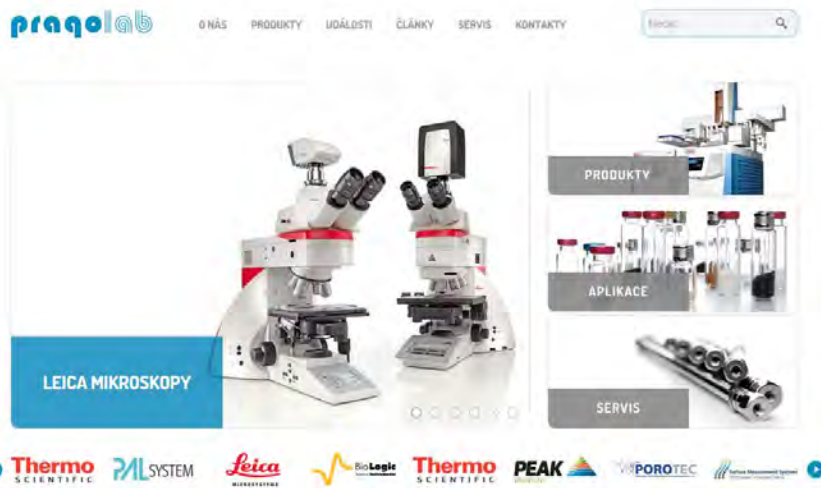


Leica DVM6 + nový software LAS X

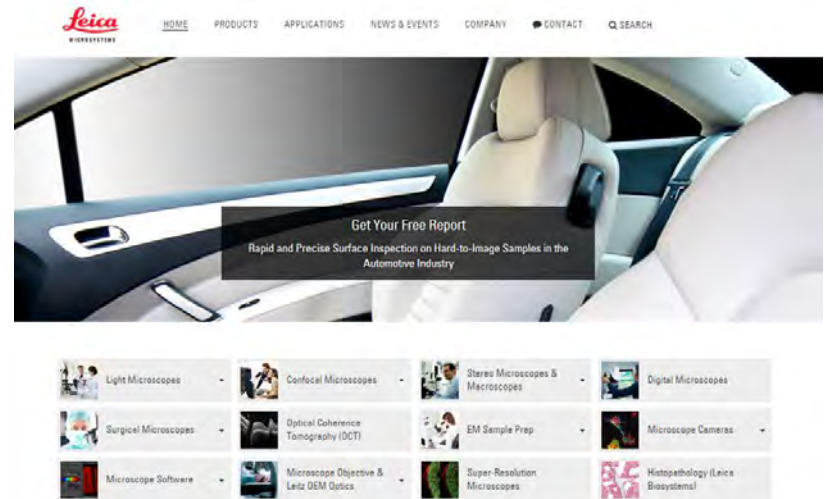


Kontakt a informace

<http://www.pragolab.cz/>



<http://www.leica-microsystems.com/>



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Email: kopecky@pragolab.cz

<http://www.leica-microsystems.com/science-lab/>



Náš stánek č. B37



Děkuji za pozornost
Martin Kopecký